

REBUTTAL TESTIMONY OF
ERIC H. BELL, P.E.
ON BEHALF OF
DOMINION ENERGY SOUTH CAROLINA, INC.
DOCKET NO. 2019-184-E

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Eric H. Bell. My business address is 220 Operation Way, Cayce,
3 South Carolina.

4
5 **Q. ARE YOU THE SAME ERIC BELL THAT OFFERED DIRECT**
6 **TESTIMONY IN THIS DOCKET?**

7 A. Yes, I am.

8
9 **Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?**

10 A. The purpose of my rebuttal testimony is to discuss the response of Dominion
11 Energy South Carolina, Inc. (“DESC” or the “Company”) to certain issues raised
12 in 1) the direct testimony of Mr. Brian Horii filed on behalf of the South Carolina
13 Office of Regulatory Staff (“ORS”); and 2) the direct testimony of Mr. Derek P.
14 Stenclik and Mr. Ed Burgess, both filed on behalf of the South Carolina Coastal
15 Conservation League and the Southern Alliance for Clean Energy (collectively,
16 “CCL/SACE”).

REBUTTAL TO TESTIMONY OF MR. BRIAN HORII

Q. WITH RESPECT TO MR. HORII'S TESTIMONY, PLEASE EXPLAIN HOW YOU ORGANIZE YOUR RESPONSES.

A. My rebuttal testimony sequentially addresses certain issues raised by Mr. Horii as they appear in his direct testimony.

Q. ON PAGE 11, LINES 10 THROUGH 11, AND ON PAGE 22, ON PAGE 22, LINE 2 THROUGH PAGE 23, LINE 10, MR. HORII EXPRESSES CONCERN THAT NAVIGANT'S COST OF VARIABLE INTEGRATION STUDY ("NAVIGANT STUDY") OVERSTATED RESERVE NEEDS BY HOLDING RESERVE LEVELS CONSTANT THROUGHOUT EACH DAY OF THE YEAR. DO YOU BELIEVE HIS CONCERNS ARE REASONABLE?

A. No. Navigant has clearly recognized and addressed this issue as explained in detail on pages 26 and 27 of the Navigant Study. DESC and Navigant have previously stated that additional reserves for variable energy resources ("VER") should be applied in hours that VERs are forecasted to deliver energy. Although not specifically addressed, by Mr. Horii or me, it is extremely important to note that in daily generation planning, DESC uses an hourly profile for operating reserves based on the VACAR contingency reserve requirement and additional operating reserves for the hour-by-hour solar generation forecast by DESC using detailed

1 forecast weather data. Adjusting dispatch plans based on up to date solar forecasts
2 reduces the fuel cost impact of VERs in unit commitment planning and in daily
3 operations. Accounting for the difference between PROMOD's limitations and
4 actual costs incurred, Navigant has made a logical and appropriate adjustment to the
5 variable integration cost ("VIC") calculation to adjust for the difference between
6 constant reserves and lesser amounts needed on 62% of days modeled. For clarity,
7 this adjustment is not used or needed in the DESC Avoided Cost Methodology
8 because the additional reserve requirement is included as an hourly profile and is an
9 accurate and required input in the avoided cost calculation.

10
11 **Q. ON PAGE 27, LINES 19-20, AND ON PAGE 28, LINE 1 THROUGH PAGE**
12 **29, LINE 4, MR. HORII TESTIFIES THAT DESC OVERSTATED THE**
13 **NEED FOR ADDITIONAL OPERATING RESERVES TO**
14 **ACCOMMODATE THE INTEGRATION OF SOLAR RESOURCES. DO**
15 **YOU AGREE?**

16 A. No. DESC has data that clearly shows that drops of 35% of installed PV
17 Solar MW occur with significant frequency over a one-hour timeframe. Also, larger
18 drops occur 4% of the time which is very significant. Reducing the flexible reserve
19 level below 35% poses a higher risk than is acceptable to system operators who are
20 committed to providing reliable service to our customers. An important gauge of
21 reliability risk is the fact that the system can also be expected to experience
22 unpredicted drops in solar generation of 62% of installed Solar MW over 4 hours as

1 identified in the same DESC study. This is very much in line with the results of the
2 Navigant Study of NREL solar forecast data. DESC has already experienced many
3 large and unpredicted drops in solar generation. It is not realistic to assume these
4 drops will not coincide with a unit trip, unit forced outage, limited transmission
5 interface, or unusually high loads. To the contrary, it is likely to only be a matter of
6 time before such a coincidence occurs, and we are in a situation where solar
7 variability results in a generation shortfall.

8 To put this risk in perspective, consider that there is about a 32% probability
9 (very significant) that at least one baseload or intermediate generating unit will be
10 forced out during the year. With solar generating more than 50% of the hours in a
11 year and cloud formations somewhere across the system almost every day
12 interfering with solar output, there is a significant risk of an overlap of solar drops
13 and base/intermediate generator outages. This coincidence is a risk that our
14 dispatchers must plan to mitigate. Furthermore, as more solar is added to the system,
15 the likelihood of this overlap only gets larger. Mr. Horii's suggestion that additional
16 reserves for this coincident probability is overstated is incorrect.

17 Another potential misconception is that the reserve requirement for a
18 Balancing Area is just a single number or metric, but instead, all applicable FERC
19 BAL Standards must always be met. It is well known that DESC is a member of
20 the Virginia and Carolina's Reserve Sharing Group ("VACAR"), and the DESC
21 share of contingency reserves is 196 MW DESC must replace those reserves, if
22 drawn upon, within by the end of the day, and VACAR must re-establish reserves

1 within 90 minutes. But this is only the start of the analysis. As DESC plans for
2 reserves each hour, 40 MW for intra-hour load variation (contingencies may occur
3 when instantaneous demand is higher than the forecasted hourly integrated load) is
4 added to planned operating reserves. Flexible reserves are also added operating
5 reserves to meet the challenge of solar intermittency and other un-forecasted
6 variations in demand and supply above VACAR contingency reserve requirements.
7 Actually, regardless of having the 196 MW in reserves, FERC regulates the
8 Balancing Area Authority by measuring compliance against the BAL Standards. In
9 particular, DESC must comply with ERO Standards BAL-001 (Balancing Area
10 ACE Limit), BAL-002 (Disturbance Control Standard), and BAL-003 (Frequency
11 Response). Please refer to the rebuttal testimony of DESC Witness Thomas
12 Hanzlik, a technical expert in the operation of a balancing area, for an explanation
13 and examples of the BAL Standards.

14 VACAR reserves are reserves that must be maintained in the face of solar
15 intermittency. They are not the answer to it. Reserves in addition to VACAR
16 reserves are needed to comply with specific BAL Standards taking into account the
17 intermittency of solar generation and the operating characteristics of DESC's
18 system. DESC therefore does not believe the current level of additional reserves is
19 too high for planning and avoided cost calculations; rather, based upon actual
20 operating experience DESC believes the additional operating reserves at issue here,
21 are necessary to meet FERC standards and basic reliability commitments. To do less

1 as suggested by Mr. Horii would be unreasonable and imprudent and would expose
2 our customers to unacceptable risks.

3
4 **Q. ON PAGE 29, LINE 5 THROUGH PAGE 29, LINE 13, MR. HORII STATES**
5 **THAT IT MAY BE APPROPRIATE FOR DESC TO USE SOLAR DROPS**
6 **OVER A SHORTER TIMEFRAME THAN 15 MINUTES AND THAT IT**
7 **MAY BE APPROPRIATE TO CALCULATE THE NEED FOR**
8 **ADDITIONAL OPERATING RESERVES BASED ON 5-MINUTE SOLAR**
9 **DROPS. HOW DO YOU RESPOND TO HIS SUGGESTION?**

10 A. As Company Witness James Neely testifies, 15 minutes is itself too short a
11 period to assess the impact of solar intermittency on the operations and economics
12 of the electric generating system. It is even less reasonable or appropriate to analyze
13 contingency or operating reserves using periods of less than 15 minutes. The use of
14 5-minute solar drop data is entirely inappropriate. Under NERC Standards, some
15 Area Control Error ("ACE") excursions and Frequency Events of less than 15
16 minutes can be absorbed by the system, and do not require an additional response
17 or reserves. Although operators would begin to respond during a larger drop using
18 regulating reserves, the event, being shorter than 15 minutes, is self-correcting by
19 definition. The Balancing Area must have the additional resources to respond and
20 maintain compliance when the ACE or Frequency Event persists beyond 15 minutes
21 which is frequently observed.

REBUTTAL TO TESTIMONY OF MR. DEREK STENCLI

Q. WITH RESPECT TO MR. STENCLI'S TESTIMONY, PLEASE EXPLAIN HOW YOU ORGANIZE YOUR RESPONSES.

A. In the same manner I responded to Mr. Horii's testimony, my rebuttal testimony sequentially addresses certain issues raised by Mr. Stencli as they appear in his direct testimony.

Q. ON PAGE 5, LINES 5 THROUGH 16, MR. STENCLI SUGGESTS THAT THE NAVIGANT STUDY ASSUMED IMPROPERLY HIGH RESERVE REQUIREMENTS THAT DO NOT ACCURATELY CAPTURE CURRENT OPERATING PRACTICES. DO YOU AGREE?

A. No, I do not. DESC's actual operating practice requires additional reserves (40% of actual output) for solar intermittency. This is greater than but generally consistent with the 35% one-hour ahead value (35% of installed solar nameplate) used in the avoided cost studies and in line with the Navigant Study 4-hour drop probability table.

DESC and other Balancing Areas are adapting to new challenges of intermittency due to solar generation. Historically, the DESC operating reserves were primarily designed to provide a 15-minute reserve to respond to a thermal unit contingency, specifically the largest thermal unit on line at any time tripping off unexpectedly. When thermal units like nuclear plants and coal and gas-fired units trip, they typically go off-line completely in a single event. All of the generation

1 that they represent is lost to the system until the outage is resolved which can take
2 a day or more. No further reduction in generation from that resource needs to be
3 accounted for in operating the system from that point forward.

4 In the past, 15-minute reserves have been calculated to allow the system to
5 recover from a thermal unit trip occurring as a single nearly instantaneous event.
6 The upper limit of the effect of that single event can be calculated to the precise
7 MW of generation that would be lost in a single event if the thermal unit tripped off-
8 line. This is the largest drop that can be expected from that event and is the drop that
9 is taken into account in setting operating reserves.

10 Solar generation is different because it is intermittent by nature. Operating
11 experience shows that the loss of solar generation does not usually occur as a single
12 nearly-instantaneous event but often occurs as a decline in generation that stretches
13 over multiple 15-minute intervals. Because of the solar intermittency events can
14 extend over multiple 15-minute blocks, measuring the loss of solar generation over
15 a 15-minute block does not capture the full loss of capability that the system may
16 be required to overcome in response as it does where a thermal unit trip is involved.
17 For that reason, standard 15-minute reserves must be supplemented with additional
18 reserves to cover 40% of the solar production at any given time. This allows for the
19 system to respond to a loss of solar capacity that evolves over multiple 15-minute
20 periods while still maintaining the operating reserves necessary to respond to the
21 largest thermal unit in operation at that time tripping off line.

1 This is a verifiable operational reality. An unanticipated drop in PV Solar
2 production often persists beyond 15 minutes and solar generation can drop even
3 more in over subsequent 15-minute periods. For that reason, in responding to solar
4 intermittency, Balancing Areas must recover from drops in solar generation that
5 may occur over multiple 15-minute increments and continue to evolve over several
6 hours. Therefore, in responding to solar intermittency, consideration of 15-minute
7 and 1-hour drops is necessary, and if the next available unit takes 3 to 4 hours or
8 more to ramp up to supply load, the evaluation of risk and reserves must be
9 considered 3 to 4 hours out from the present time.

10 Plant characteristics like start times can be complicated as illustrated by
11 Jasper Station Combined Cycle. Jasper uses 3 combustion turbines to generate
12 power and supply steam to a single steam turbine. If Jasper is off-line, startup times
13 are normally 6 hours to 10 hours depending upon turbine metal temperature. If
14 Jasper is operating online with at least one combustion turbine and steam turbine in
15 service, achieving a higher output level or full load can take a few minutes to 3 hours
16 depending upon the operating status of the combustion turbines. Boiler units such
17 as coal-fired plants can take 1 or 2 days to get on line and provide a reserve
18 contribution. Also, because the probability is significant of a coincidence of a
19 thermal unit's forced outage and a large unplanned drop in PV Solar persisting for
20 hours, prudent operators must consider and plan for both contingencies happening
21 together. This is why the flexible reserves for solar intermittency must be
22 maintained in addition to the underlying contingency reserve requirement and may

1 require consideration of events stretching out over 15 minutes, an hour or up to 4
2 hours out.

3
4 **Q. ON PAGE 5, LINE 17 THROUGH PAGE 6, LINE 7, MR. STENCLIK**
5 **IDENTIFIES CERTAIN CONCERNS WITH THE STUDY, INCLUDING**
6 **THAT ADDITIONAL FIXED SOLAR RESERVE REQUIREMENTS WERE**
7 **IMPOSED FOR EACH HOUR OF THE YEAR RATHER THAN BEING A**
8 **FUNCTION OF HOURLY FORECASTED SOLAR GENERATION. DO**
9 **YOU AGREE WITH HIS CONCERNS?**

10 A. No. DESC has been using and will continue to use hourly forecasted solar
11 production and actual solar production to plan and maintain reserves on an hourly
12 basis for real-time system operations. In the DESC avoided cost/benefit calculation,
13 the requirement for operating reserves of 35% of installed PV Solar MWs was
14 implemented on an hourly basis corresponding to solar operating characteristics and
15 did not overstate required reserves or associated costs.

16
17 **Q. ON PAGE 7, LINES 8 THROUGH 17, MR. STENCLIK STATES THAT**
18 **DESC FAILED TO EVALUATE LESS COSTLY METHODS OF**
19 **INTEGRATING LOW-COST RENEWABLE RESOURCES. IS HE**
20 **CORRECT?**

21 A. No, he is not. DESC and Navigant have compared the cost effectiveness of
22 adding storage or quick start units to the VIC calculation within the first 1,048 MW

1 of PPA's. The information on pages 30 and 31 of the Navigant Study make it clear
2 that DESC and Navigant have considered these options but noted that the fixed cost
3 incurred is very likely to be higher than the cost of using existing units to provide
4 additional operating reserves.

5
6 **Q. ON PAGE 8, LINE 1 THROUGH PAGE 10, LINE 12, MR. STENCLIK**
7 **STATES THAT SOLAR VARIABILITY AND FORECAST ERRORS DO**
8 **NOT POSE RELIABILITY RISKS TO DESC AND THAT OTHER GRID**
9 **OPERATORS HAVE SUCCESSFULLY INTEGRATED VARIABLE**
10 **RENEWABLE ENERGY WITHOUT SIGNIFICANT INCREASE IN**
11 **RESERVE REQUIREMENTS. HOW DO YOU RESPOND?**

12 **A.** Mr. Stenclik's comments appear to be from the viewpoint of someone that
13 has no intention of meeting the FERC and other obligations that govern a Balancing
14 Area Authority. For DESC to simply ride the tie lines on the Eastern Interconnect
15 in the event of a sudden loss of 1,048 MW of solar generation would be irresponsible
16 and could subject the Company to penalties and to being cut off from the grid by its
17 neighboring utilities.

18 Since FirstEnergy caused the Northeast Blackout of 2003, FERC has had
19 authority to fine companies that violate the NERC/FERC Electric Reliability
20 Organization standards. FERC has the authority to administer penalties of \$1
21 million per day per infraction, which gives it almost unlimited discretion to

1 administer fines. For example, in 2010, FP&L was fined \$25 million for non-
2 compliant operations that resulted in a blackout.

3 FERC regulates the operator of a Balancing Area and holds each operator
4 responsible for compliance independently of the surrounding areas. In particular,
5 DESC must comply with ERO Standards BAL-001 (Balancing Area ACE Limit),
6 BAL-002 (Disturbance Control Standard), and BAL-003 (Frequency Response) and
7 many other requirements. The intermittency of PV Solar impacts DESC's ability to
8 comply with these standards on a daily basis.

9 While Mr. Stenclik suggests that "there is no reliability risk" because DESC
10 could solve integration problems simply by coordinating with "neighboring utilities
11 and balancing areas [that] are integrating greater amounts of solar power just as
12 DESC is," he is simply wrong. Although the Standards do not prevent control areas
13 from coordinating solutions to integration (but individual Balancing Area Authority
14 responsibility is emphasized by FERC), DESC is obligated to control ACE within
15 established tolerances on a continuous basis, correct frequency events in 15 minutes,
16 and maintain contingency reserves. FERC does not intend for DESC to shift the
17 risk of solar intermittency to its neighboring utilities or to the Eastern Interconnect
18 to avoid the cost of maintaining sufficient reserves.

19 Assuming a coordinated approach to solar intermittency is workable, it will
20 require the agreement of multiple utilities and will involve quantifying and sharing
21 the resulting costs. The success or value of such an approach cannot be assumed at
22 this time and is beyond the scope of the current proceeding.

1 Regarding Mr. Stenclik's identification of integration experiences on some
2 western grids, these examples do not support his suggestion that integration is an
3 easy or simple process. To the contrary, ERCOT, which he identifies on page 9 of
4 his direct testimony, has over 70,000 MWs of peak load and many more years of
5 experience with VERs. Even so, ERCOT had to undertake the modernization of its
6 structured energy markets and add new energy imbalance markets to account for
7 VERs reserve levels and costs. This process that took several years. While ERCOT
8 has made progress in this regard, the long and difficult effort involved emphasizes
9 the slow and costly nature of adapting reliable operations to the intermittency of
10 renewable generation.

11 Comparisons of the DESC system to CAISO and ERCOT are not meaningful
12 or useful because the systems are extremely different in size, complexity, operation
13 and administration. Even so, regions such as CAISO and ERCOT have been
14 observed to increase their requirements or change their market structure to increase
15 system flexibility for integrating renewables.

16
17 **REBUTTAL TO TESTIMONY OF MR. ED BURGESS**

18 **Q. WITH RESPECT TO MR. BURGESS'S TESTIMONY, PLEASE EXPLAIN**
19 **HOW YOU ORGANIZE YOUR RESPONSES.**

20 **A.**My rebuttal testimony addresses a single issue raised by Mr. Burgess in his
21 direct testimony.
22

1 **Q. ON PAGE 63, LINE 8 THROUGH PAGE 65, LINE 4, OF HIS DIRECT**
2 **TESTIMONY, MR. BURGESS STATES THAT A VARIABLE**
3 **INTEGRATION CHARGE SHOULD NOT BE ESTABLISHED UNTIL AN**
4 **INDEPENDENT INTEGRATION STUDY HAS BEEN PERFORMED. DO**
5 **YOU AGREE?**

6 A. No. It is not premature to impose an integration charge for existing solar
7 PPAs. Today, approximately 500 MW of these facilities have entered commercial
8 operation and in early 2021, DESC anticipates that it will have over 1,000 MW
9 installed on its system. The DESC system is already experiencing the effects of
10 these resources and customers are currently paying additional costs. As certain
11 executed PPAs authorize, these variable integration charges should be recovered
12 from the solar providers and should be done at the earliest opportunity to remove
13 these costs from customers' fuel costs. Mr. Burgess cites a section of Act 62 that
14 directs ORS to study the entire state and the benefits of solar and other types of
15 generation to modify or enhance the State Energy Plan. The integration study that
16 Mr. Burgess cites is forward looking, but the variable integration charges at issue
17 here apply only to certain existing PPAs. Therefore, DESC respectfully requests
18 that any delay requested by Mr. Burgess be denied.

19
20 **Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?**

21 A. Yes.